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BRIEFER ARTICLES

APOGAMY IN *PELLAEA ATROPURPUREA*

In the course of a study of fertilization and related phenomena in several ferns, a culture of *Pellaea atropurpurea* (L.) Link was found to have developed embryo sporophytes apogamously. The spores of this species were collected in October and sown on clay soil December 13, 1910. The soil was sifted into a small pot, moistened with water, and sterilized in an oven. The culture was kept under a bell jar in a Wardian case in the university greenhouse. Watering was found necessary but once, and was accomplished from below with distilled water.

The prothallia grew rather rapidly, and hundreds carefully examined at various times showed no indications of antheridia or archegonia. Two and one-half months after the spores were sown, the first indications were noticed of the development of apogamous embryos. Many prothallia were again examined on both surfaces for the appearance of sex organs, with negative results. On March 13, 1911, 110 prothallia were examined with special care; 47 bore sporophytes in various stages of development, but no sex organs were found in any case.

At an early stage in development it is difficult to distinguish between young antheridia and rhizoids. Young antheridia may be hidden among the rhizoids and escape attention; rhizoids, however, were in no case produced in great abundance in the culture in question. Thus the possibility is not excluded that rudimentary antheridia may have been formed; but my observations make it certain that none developed beyond the earliest stages, and that no archegonia were produced on these prothallia at any time.

The prothallia of this fern are of a darker green color than the prothallia of several other species in my cultures. They are generally heartshaped with a deeply cut notch, but many irregularly shaped prothallia occur. The first appearance of the apogamous embryo is indicated by a small darkened area usually a short distance back of the growing point. This, as sections made at this time show, represents a region of active division, the prothallial cells concerned being much smaller than the neighboring ones which are not concerned in embryo formation. Embryos are formed on the inner sides of the lobes, as well as a short distance back of the apical notch. Long ribbon-shaped prothallia without apical notches also develop sporophytes at their distal ends. Sporophytes are often formed, therefore, in regions quite distinct from the meristematic area in which archegonia are ordinarily developed.

Soon after the beginning of embryo development, hairs appear surrounding the region of active growth. These originate from the area of the prothallium which is involved in the development of the embryo. Still later, the embryo projects from the prothallium, somewhat inclosed by the hairs, each of which is composed of several cells with large nuclei. As the embryo continues to grow, the primary leaf, from the petiole of which numerous hairs develop, makes its appearance. Later the primary root and stem are formed. At no time was there any evidence of the development of a structure which could be thought to correspond to a foot. In several cases two sporophytes began their development on the same prothallium. From studies so far made, it appears that both interior and surface cells of the prothallium are involved in the formation of the sporophyte.

During the present season, apogamous embryos have begun their development upon a large number of prothallia of this species in four cultures growing upon peaty soil. The first embryos were observed about one month after the sowing of the spores.

So far as I know, apogamy has not been previously reported in *Pellaea atropurpurea*, although WORONIN (1907) reported its occurrence in *P. flavens*, *P. nivens*, and *P. tenera*.—W. N. STEIL, *University of Wisconsin, Madison.*